CLAIMS

We claim:

1. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) that move along an overall axial direction (100) and are capable of transmitting approximately axial forces, one of the shafts called the "driving shaft" (1) being connected to an axial translation device, typically a jack, and the other shaft called the "driven shaft" (2), characterised in that:

- the end of the driving shaft (1) that will come into contact with the end of the driven shaft (2) comprises an annular groove (11) close to an axial end extension (17 and 8), with axial height H1,
- the end of the driven shaft (2) that will come into contact with the end of the driving shaft (1) comprises an annular groove (12) close to an axial extension (18 and 9), with axial height H2,
- the ends are connected inside an approximately cylindrical coupling (10), the coupling being provided with:
  - a first annular shoulder (13), with a shape complementary to the shape of the annular groove (11) located close to the end axial extension (17 and 8) of the driving shaft (1), without clearance,
  - a second annular shoulder (14), with a shape complementary to the shape of the annular groove (12) close to the end axial extension (18 and 9) of the driven shaft (2), a radial clearance being provided between the complementary surfaces of the annular shoulder (14) of the coupling (10) and the annular groove (12) of the driven shaft (2),
  - a cavity (16) that will contain the end axial extensions (17 and 8; 18 and 9) of the shafts, the axial height of the cavity (16) being strictly greater than the sum of the axial heights H1 and H2 of the end axial extensions;

  and in that

- the end axial extension (17 and 8) of the driving shaft (1) and the end axial extension (18 and 9) of the driven shaft (2) remain in permanent mechanical and

electrical contact due to an elastic conducting means (7), typically a metallic helical spring.

2. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) according to claim 1, in which the annular groove (11) of the driving shaft (1) has two walls perpendicular to the axis (100) separated by a distance equal to an axial height H0, and a bottom in the form of a cylindrical surface coaxial with the axis (100) with diameter C and in which the section of the annular shoulder (13) has a shape complementary to the shape of the coupling (10) and also has two walls perpendicular to the axis separated by a distance equal to a value slightly less than H0, typically $H0 - \varepsilon$, where $0.05\ \text{mm} \leq \varepsilon \leq 0.2\ \text{mm}$, and a cylindrical wall with a diameter very slightly greater than C, typically $C + \varepsilon'$, where $0.05\ \text{mm} \leq \varepsilon' \leq 0.2\ \text{mm}$.

3. System for connecting two shafts in translation according to either claim 1 or 2, in which the annular groove (12) of the driven shaft (2) has two walls perpendicular to the axis of the shaft (2) separated by a distance equal to an axial height H3, and a bottom in the form of a cylindrical surface with diameter ∅G and in which the annular shoulder (14) with a complementary shape to the coupling (10) has also two walls perpendicular to the axis of the coupling and separated by a distance equal to a value H4 strictly less than H3, and a cylindrical wall with a diameter strictly greater than the diameter of the annular groove (12) of the driven shaft (2).

4. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) according to claim 3, in which there is a radial clearance J1 between the outer surface of the end axial extension (18 and 9) of the driven shaft (2) and the wall of the cavity (16) formed in the coupling (10) and designed to hold the end axial extensions (1 and 2) of the two shafts.

5. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) according to claim 3, in which the difference between the axial height of the cavity (16) and the sum of the axial heights H1 and H2 corresponds to a maximum clearance J2 between the shaft ends and the difference between the axial height H3 of

the annular groove (12) of the driven shaft (2) and the axial height H4 of the second annular shoulder (14) of the coupling (10) corresponds to a maximum clearance J4 strictly greater than the maximum clearance J2 between the shaft ends.

6. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) according to any one of claims 1 to 5, in which the end axial extension (17 and 8) of the driving shaft (1) comprises a projection (8), the final end of which has a transverse wall that occupies a convex surface of revolution with respect to the axis of the driving shaft (1), while the end axial extension (18 and 9) of the driven shaft (2) comprises a projection (9), the final end of which has a transverse wall with a profile such that when the two shafts are put into contact, the contact area between the projection (9) and the projection (8) of the driving shaft (1) is located at a point as close as possible to the axis (100) of the driving shaft (1).

7. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) according to claim 6, in which the end axial extension (18 and 9) of the driven shaft (2) comprises a projection (9) for which the final end has a transverse wall that occupies a convex surface of revolution about the axis of the driven shaft (2), with a greater curvature at its mid-point than the curvature of the transverse wall of the projection (8) of the driving shaft (1).

8. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) according to any one of claims 1 to 7, in which the end axial extensions of each shaft (1 and 2) comprise a base (17 and 18 respectively) located between the annular groove (13 and 14 respectively) and the projection (7 and 8 respectively), the base (17 and 18 respectively) and the projection (7 and 8 respectively) being arranged such that the elastic conducting means (7) can bear on each of the shafts, such that there is a continuous electrical contact between the two shafts.

9. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) according to any one of claims 1 to 8, in which the end of the driving shaft (1) comprises an annular groove (11) and an end axial extension (17 and 8)

adjacent to each other, such that since the cylindrical base (17) of the end axial extension has a diameter greater than the diameter of the annular groove (11), a transverse wall is formed that will come into contact with the first shoulder (13) of the coupling and in which the driven shaft (2) comprises an annular groove (12) and an end axial extension (18 and 9) that are adjacent to each other, such that since the cylindrical base (18) of the end axial extension has a diameter greater than the diameter of the annular groove (12), a transverse wall is formed that will come into contact with the second shoulder (14) of the coupling, the second shoulder being separated from the first shoulder such that together they delimit the cavity (16) within the coupling into which the end axial extensions of the shaft will fit.

10. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) according to any one of claims 1 to 9, in which the coupling (10) comprises two shells (3 and 4) in the form of half cylinders, comprising the first shoulder (13) and the second shoulder (14) on their inner face, the shells being placed such that the first shoulder (13) and the second shoulder (14) are facing the annular grooves (11 and 12 respectively) in the driving shaft (1) and the driven shaft (2), and being held fixed to each other by means of a cylindrical sleeve (5) slid onto one end of one of the shafts (1).

11. Mechanical and electrical connection system between the ends of two approximately coaxial shafts (1 and 2) according to claim 10, in which the sleeve (5) is fixed in place at one end using a shoulder (15) acting as a stop to the shells (3 and 4) and at the other end using an attachment means fixing each shell in place with the sleeve (5), typically a pin (6) passing through the sleeve.

12. Electrolytic aluminium production pot equipment comprising a mechanical and electrical connection system between the ends of a driving shaft (1) and a driven shaft (2) approximately coaxial to each other, according to any one of claims 1 to 11.

13. Crustbreaking and measuring device, used to break the surface crust of the solidified bath and measure the temperature and level of the electrolyte in a pot for the production of aluminium by fused bath electrolysis of the alumina dissolved in the electrolyte, the device being characterised in that it comprises a mechanical and electrical connecting

system between the ends of an approximately coaxial driving shaft (1) and a driven shaft (2) according to any one of claims 1 to 11, in which the driving shaft (1) is the rod of the pneumatic crustbreaking jack and the driven shaft (2) is the extension rod that supports the chisel that will plunge into the electrolyte.